

**U.S.ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY  
540 S. MORRIS AVE., MONTGOMERY, AL 36115  
U ANALYSES**

**REPORT OF SAMPLE DELIVERY GROUP #1200002**

Project: Dimock Residential GW Site, Dimock, PA  
Analysis method: Actinides (Uranium) by Extraction Chromatography  
Report ID: 1200002-U  
Report type: Original  
Date reported: 04/05/2012  
Total pages in report: 20

**SAMPLES**

NAREL Sample #	Client Sample ID	Location	Matrix	Date Collected	Date Received
B2.02559T	FB19	PA:DIMOCK	WATER-DRINKING	03/05/2012	03/07/2012
B2.02560K	HW56	PA:DIMOCK	WATER-DRINKING	03/05/2012	03/07/2012
B2.02561L	HW60	PA:DIMOCK	WATER-DRINKING	03/05/2012	03/07/2012
B2.02617K	FB20	PA:DIMOCK	WATER-DRINKING	03/06/2012	03/08/2012
B2.02618L	HW61	PA:DIMOCK	WATER-DRINKING	03/06/2012	03/08/2012
B2.02619M	HW61Z	PA:DIMOCK	WATER-DRINKING	03/06/2012	03/08/2012
B2.02675W	FB21	PA:DIMOCK	WATER-DRINKING	03/08/2012	03/09/2012
B2.02676X	HW50	PA:DIMOCK	WATER-DRINKING	03/08/2012	03/09/2012

**EXCEPTIONS**

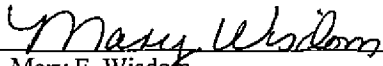
1. **Packaging and shipping** – No problems were observed.
2. **Documentation** – No problems were observed.
3. **Sample preparation** – No problems were encountered.
4. **Analysis** – No problems were encountered.
5. **Holding times** – No holding times were specified.

**QUALITY CONTROL**

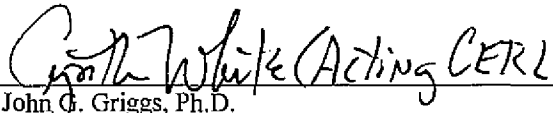
1. **QC samples** – All QC analysis results met NAREL acceptance criteria.
2. **Yields** – All chemical yields were within acceptance limits.
3. **Instruments** – Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

## CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.

  
\_\_\_\_\_  
Mary F. Wisdom  
Quality Assurance Manager, NAREL

4-10-12  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
John G. Griggs, Ph.D.  
Director, Center for Environmental Radioanalytical  
Laboratory Science

4-11-12  
\_\_\_\_\_  
Date



## GENERAL INFORMATION

### SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

### ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Method blank

### QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

### EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**ANALYSIS SUMMARY**

Analysis Procedure: NAREL U-EICHRM  
Title: Actinides (Uranium) by Extraction Chromatography

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Assay Batch #	QC Batch #
B2.02559T	DUP	N/A	04/04/2012	0015850P	0008597U
B2.02560K		N/A	04/04/2012	0015850P	0008597U
B2.02561L		N/A	04/04/2012	0015850P	0008597U
B2.02561L		N/A	04/04/2012	0015850P	0008597U
B2.02617K		N/A	04/04/2012	0015850P	0008597U
B2.02618L		N/A	04/04/2012	0015850P	0008597U
B2.02619M		N/A	04/04/2012	0015850P	0008597U
B2.02675W		N/A	04/04/2012	0015850P	0008597U
B2.02676X		N/A	04/04/2012	0015850P	0008597U
LCS-00634463C *	LCS	N/A	04/04/2012	0015850P	0008597U
RBK-00634462B *	RBK	N/A	04/04/2012	0015850P	0008597U

\* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**PREPARATION METHOD(S) USED**

Procedure ID	Title

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	B2.02559T	QC batch #:	0008597U
Matrix:	WATER-DRINKING	Assay batch #:	0015850P
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS98	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	1.06e-01	8.0e-02	5.7e-02	PCI/L	04/03/2012 11:44 CDT
U235	3.17e-02	5.6e-02	6.9e-02	PCI/L	04/03/2012 11:44 CDT
U238	5.74e-02	7.4e-02	1.1e-01	PCI/L	04/03/2012 11:44 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	B2.02560K	QC batch #:	0008597U
Matrix:	WATER-DRINKING	Assay batch #:	0015850P
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS100	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	6.27e-01	2.1e-01	8.8e-02	PCI/L	04/03/2012 11:44 CDT
U235	-6.16e-03	4.1e-02	1.1e-01	PCI/L	04/03/2012 11:44 CDT
U238	2.88e-01	1.4e-01	8.8e-02	PCI/L	04/03/2012 11:44 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	B2.02561L	QC batch #:	0008597U
Matrix:	WATER-DRINKING	Assay batch #:	0015850P
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS101	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	8.75e-02	8.0e-02	9.1e-02	PCI/L	04/03/2012 11:44 CDT
U235	0.00e+00	3.5e-02	7.2e-02	PCI/L	04/03/2012 11:44 CDT
U238	6.45e-02	6.9e-02	7.9e-02	PCI/L	04/03/2012 11:44 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	B2.02561L	QC batch #:	0008597U
Matrix:	WATER-DRINKING	Assay batch #:	0015850P
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	DUP
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS102	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	5.46e-02	6.2e-02	5.9e-02	PCI/L	04/03/2012 11:44 CDT
U235	3.27e-02	5.8e-02	7.1e-02	PCI/L	04/03/2012 11:44 CDT
U238	2.27e-02	4.9e-02	7.8e-02	PCI/L	04/03/2012 11:44 CDT



**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	B2.02617K	QC batch #:	0008597U
Matrix:	WATER-DRINKING	Assay batch #:	0015850P
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS103	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	1.13e-01	8.0e-02	5.4e-02	PCI/L	04/03/2012 11:44 CDT
U235	3.01e-02	5.3e-02	6.5e-02	PCI/L	04/03/2012 11:44 CDT
U238	6.69e-02	6.8e-02	8.2e-02	PCI/L	04/03/2012 11:44 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	B2.02618L	QC batch #:	0008597U
Matrix:	WATER-DRINKING	Assay batch #:	0015850P
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS105	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	2.21e-01	1.1e-01	5.6e-02	PCI/L	04/03/2012 11:44 CDT
U235	3.12e-02	5.5e-02	6.7e-02	PCI/L	04/03/2012 11:44 CDT
U238	1.91e-01	1.1e-01	7.5e-02	PCI/L	04/03/2012 11:44 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	B2.02619M	QC batch #:	0008597U
Matrix:	WATER-DRINKING	Assay batch #:	0015850P
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 13:41	1000.0	AS106	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	3.50e-01	1.5e-01	9.7e-02	PCI/L	04/03/2012 13:41 CDT
U235	1.61e-02	4.7e-02	7.0e-02	PCI/L	04/03/2012 13:41 CDT
U238	1.30e-01	1.1e-01	1.4e-01	PCI/L	04/03/2012 13:41 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	B2.02675W	QC batch #:	0008597U
Matrix:	WATER-DRINKING	Assay batch #:	0015850P
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS107	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	2.74e-02	4.8e-02	5.9e-02	PCI/L	04/03/2012 11:44 CDT
U235	0.00e+00	3.5e-02	7.1e-02	PCI/L	04/03/2012 11:44 CDT
U238	6.40e-02	6.9e-02	7.8e-02	PCI/L	04/03/2012 11:44 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	B2.02676X	QC batch #:	0008597U
Matrix:	WATER-DRINKING	Assay batch #:	0015850P
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS108	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	1.05e+00	2.5e-01	5.8e-02	PCI/L	04/03/2012 11:44 CDT
U235	1.07e-02	4.8e-02	9.2e-02	PCI/L	04/03/2012 11:44 CDT
U238	7.20e-01	2.1e-01	7.7e-02	PCI/L	04/03/2012 11:44 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	LCS-00634463C	QC batch #:	0008597U
Matrix:	N/A	Assay batch #:	0015850P
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS109	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	1.93e+00	2.1e-01	1.7e-02	PCI	04/03/2012 11:44 CDT
U235	8.22e-02	3.7e-02	2.1e-02	PCI	04/03/2012 11:44 CDT
U238	1.94e+00	2.1e-01	1.7e-02	PCI	04/03/2012 11:44 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG #1200002**

**SAMPLE ANALYSIS REPORT**

Sample #:	RBK-00634462B	QC batch #:	0008597U
Matrix:	N/A	Assay batch #:	0015850P
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL U-EICHROM
Dry/wet weight:	N/A	Analyst:	AS
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

**COUNTING INFORMATION**

Date and time	Duration (min)	Detector ID	Operator
04/03/2012 11:44	1000.0	AS110	RCL

**ANALYTICAL RESULTS**

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
U234	1.16e-02	1.3e-02	1.2e-02	PCI	04/03/2012 11:44 CDT
U235	2.31e-03	1.0e-02	2.0e-02	PCI	04/03/2012 11:44 CDT
U238	9.64e-04	8.8e-03	1.9e-02	PCI	04/03/2012 11:44 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

**SDG 1200002**

**QC BATCH SUMMARY**

QC batch #: 0008597U  
Preparation procedure: N/A  
Analysis procedure: NAREL U-EICHROM

NAREL Sample #	QC Type	Yield (%)	$\pm 2 \sigma$ Uncertainty (%)	Analyst
B2.02559T	DUP	84.82 %	7.20 %	AS
B2.02560K		74.24 %	6.62 %	AS
B2.02561L		82.92 %	7.14 %	AS
B2.02561L		85.43 %	7.32 %	AS
B2.02617K		90.89 %	7.59 %	AS
B2.02618L		84.50 %	7.14 %	AS
B2.02619M		80.79 %	6.89 %	AS
B2.02675W		81.32 %	6.98 %	AS
B2.02676X		84.29 %	7.19 %	AS
LCS-00634463C *	LCS	91.28 %	7.54 %	AS
RBK-00634462B *	RBK	101.11 %	8.25 %	AS

\* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.



National Air and Radiation Environmental Laboratory  
QC Batch Report

QC Batch #: 0008597U

Analytical Method: NAREL U-BICHROM

METHOD BLANKS (PCI)

Sample ID	Nuclide	Activity $\pm 2\sigma$	Prep Date	Flags
00634462B	U234	$1.16e-02 \pm 1.3e-02$	2012-03-28	J
00634462B	U235	$2.31e-03 \pm 1.0e-02$	2012-03-28	J
00634462B	U238	$9.64e-04 \pm 8.8e-03$	2012-03-28	J

LABORATORY DUPLICATES (PCI/L)

Sample ID	Nuclide	Original $\pm 2\sigma$	Duplicate $\pm 2\sigma$	RPD	Z
B2.02561L	U234	$8.75e-02 \pm 8.0e-02$	$5.46e-02 \pm 6.2e-02$	46.43	-0.65 OK
B2.02561L	U235	$0.00e+00 \pm 3.5e-02$	$3.27e-02 \pm 5.8e-02$	200.00	0.97 OK
B2.02561L	U238	$6.45e-02 \pm 6.9e-02$	$2.27e-02 \pm 4.9e-02$	95.78	-0.99 OK

LAB CONTROL SAMPLES (PCI)

Sample ID	Nuclide	Amt Added $\pm 2\sigma$	Measured $\pm 2\sigma$	%R	Z
00634463C	U234	$1.96e+00 \pm 2.2\%$	$1.93e+00 \pm 2.1e-01$	98.49	-0.27 OK
00634463C	U235	$9.39e-02 \pm 2.2\%$	$8.22e-02 \pm 3.7e-02$	87.59	-0.62 OK
00634463C	U238	$2.04e+00 \pm 2.2\%$	$1.94e+00 \pm 2.1e-01$	95.30	-0.88 OK

Analyst:

*Albert Smith*  
Smith, Albert

*4/4/2012*

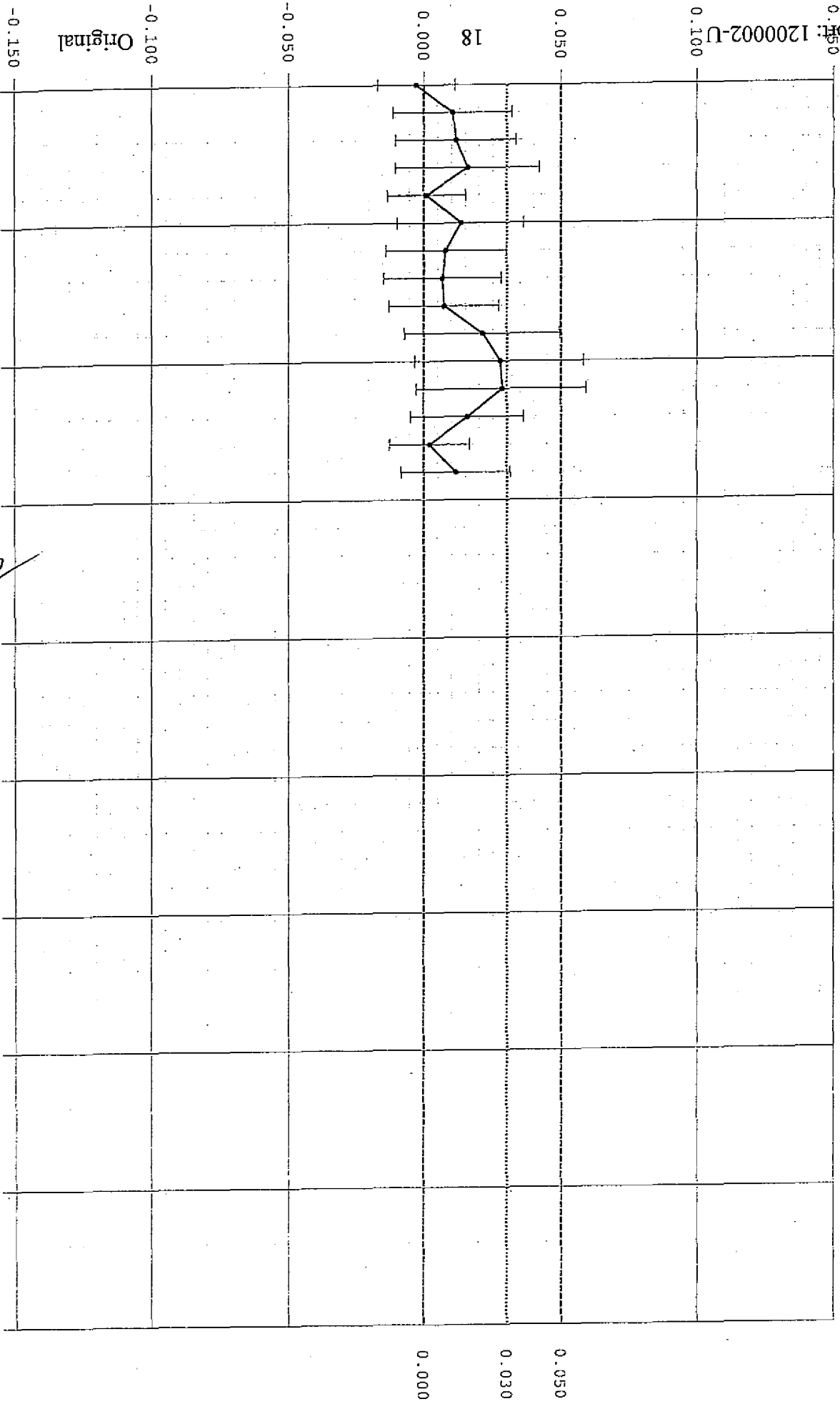
QA Officer:

*Carl J. McQuinn*

*4/5/12*

Method Blanks  
Analyte: U234  
Method: NAREL U-EICHRM  
Analyst: Smith, Albert

Report: 1200002-U



AS  
4/4/12

Method Blanks

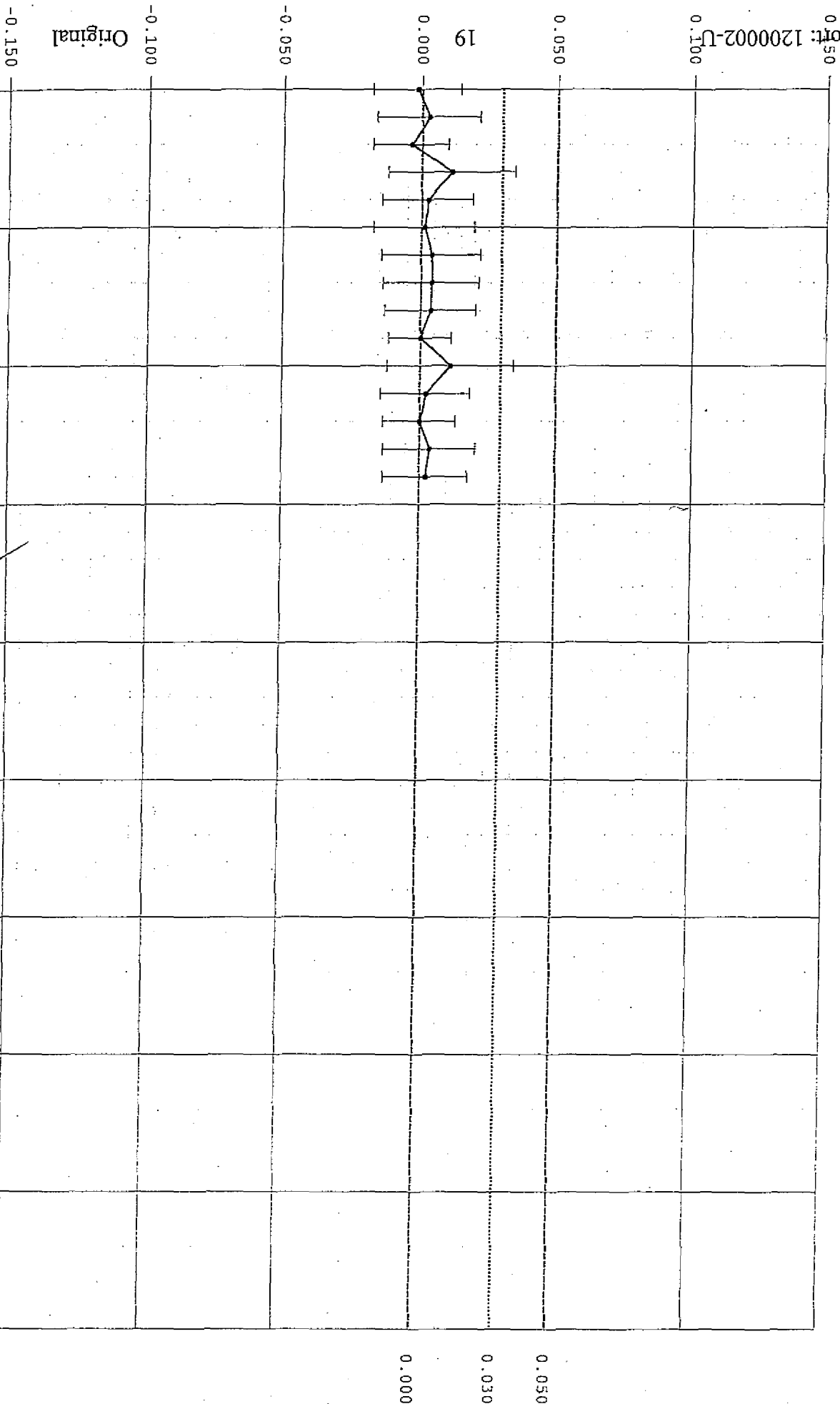
Analyte: U235

Method: NAREL U-EICHRON

Analyst: Smith, Albert

Report: 1200002-U

Original



AS  
4/4/12

Method Blanks

Analyte: U238

Method: NAREL U-EICHRON

Analyst: Smith, Albert

Report: 1200002-U

